

ANNUAL REPORT FOR 2003



**Tucker Mitigation Site
Currituck County
Project No. 6.049009T
TIP No. R-2228WM**



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SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Tucker Tract Mitigation Site. This is the fifth year that the site has been monitored for hydrologic and vegetation success. The site must demonstrate both hydrologic and vegetation success for a minimum of five years to demonstrate successful mitigation.

The Tucker Tract contains eleven groundwater-monitoring gauges. An Infinity tipping bucket rain gauge was installed in August 2000. The daily rainfall data depicted on the monitoring gauge graphs is recorded from this onsite rain gauge. An offsite rain gauge recorded at Elizabeth City and maintained by the NC State Climate Office, contributed to the daily rainfall data and historical rainfall data used for the 30-70 percentile. Twelve vegetation-monitoring plots are used to monitor the twenty-five acres planted in trees on the site.

The 2003-year represents the fifth growing season that hydrologic data has been analyzed. All of the groundwater monitoring gauges met the success criteria with saturation in the upper twelve inches for at least 12.5% of the growing season. Also, the data from the groundwater gauges exhibit similar saturation periods as the reference gauges.

At the request of the resource agencies, NCDOT performed supplemental planting of baldcypress trees in and around plots 8, 9, 10, and 11 (Zone 1) in March 2003. The fifth year vegetation monitoring of the planted areas revealed an average density of 397 trees per acre, which is above the minimum requirement of 260 trees per acre.

Based on the hydrologic and vegetation monitoring, the Tucker Tract Mitigation Site met the success criteria for the site during the 2003-growing season. The site has demonstrated both hydrologic and vegetation success for five consecutive years. NCDOT proposes to discontinue hydrologic and vegetation monitoring on the Tucker Tract Mitigation Site.

1.0 INTRODUCTION

1.1 Project Description

The Tucker Tract Mitigation Site is located in Currituck County (Figure 1). This site is part of a large property consisting of 68.3 acres. Approximately 48.1 acres have been set aside for mitigation. Approximately 28.2 acres of the 48.1 acres were developed and constructed as the Tucker Tract Mitigation Site. The remaining 20.2 acres will be reserved for possible future mitigation projects. The site was built to mitigate for the widening of NC 168 (TIP Project R-2228). The project includes the restoration of 25.1 acres of PC agricultural fields to forested wetlands and the preservation of 2.8 acres of forested wetlands and 8.7 acres of timbered wetlands.

The Final Mitigation Plan for this site was issued on April 1, 1996. Initial construction was completed in late 1997. At that time, it was determined that the site had been graded to an unacceptable level. A second contract was issued and the site was re-graded in 1998 with completion in September 1998. The site was planted in early 1999. In March 1999, NCDOT installed hydrologic monitoring gauges. In 2000, two additional gauges were installed as a result of the field review by the resource agencies. The two additional gauges were placed to track groundwater in the vicinity of Gauge TT-6. Gauge TT-6 is located at an elevation that ranges from 0.7 to 1.0 foot higher than the adjacent topography. This elevated area was delineated with GPS equipment and found to be 0.09 acres in area. Based on the comments at an agency field review in May 2002, Gauge TT-6 was removed from the site. Twelve plots were established to monitor vegetation on the Tucker Tract.

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five consecutive years or until the site is deemed successful. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during the 2003-year at the Tucker Tract Mitigation Site, as well as local climate conditions throughout the growing season.



FIGURE 1 - Site Location Map

1.3 Project History

December 1997	Site Construction Completed (Contract 1)
September 1998	Site Construction Completed (Contract 2)
March 1999	Site Planted, Monitoring Gauges Installed
October 1999	Vegetation Monitoring (1 yr.)
March – November 1999	Hydrologic Monitoring (1 yr.)
August 2000	Vegetation Monitoring (2 yr.)
March – November 2000	Hydrologic Monitoring (2 yr.)
July 2001	Vegetation Monitoring (3 yr.)
March – November 2001	Hydrologic Monitoring (3 yr.)
July 2002	Vegetation Monitoring (4 yr.)
March – November 2002	Hydrologic Monitoring (4 yr.)
October 2003	Vegetation Monitoring (5 yr.)
March – November 2003	Hydrologic Monitoring (5 yr.)

1.4 Debit Ledger

Table 1: Tucker Tract Debit Ledger

Tucker Farm	Mit. Plan			Ratios	TIP DEBIT
Habitat	Acres At Start:	Acres Remaining	% Remaining		R-2228A, BA
SPH Restoration	25.1	0	0.0		25.1
SPH Preservation	2.8	0	0.0		2.8
Upland Mgmt.	8.7	0	0.0		8.7
TOTAL	36.6	0	0.0		36.6

2.0 HYDROLOGY

2.1 Success Criteria

In accordance with Corps guidelines for wetland mitigation, the success criteria for hydrology state that the area must be inundated or saturated (within 12" of the surface) by surface or groundwater for at least a consecutive 12.5% of the growing season. Areas inundated for less than 5% of the growing season are always classified as non-wetlands. Areas inundated between 5% - 12.5% of the growing season can be classified as wetlands depending upon factors such as the presence of wetland vegetation and hydric soils.

The growing season in Currituck County begins March 20th and ends November 13th. These dates correspond to a 50% probability that temperatures will drop to 28°F or lower after March 20 and before November 13.¹ The growing season is 239 days; therefore, optimum hydrology requires inundation or saturation for 12.5% of this season, or at least 30 consecutive days. Local climate must also represent average conditions for the area.

Based on the mitigation plan, hydrologic success is based on soil saturation that is similar to the reference ecosystem and in accordance to Corps guidelines. The reference ecosystem is located onsite in an undisturbed wetland located at a slightly lower elevation in the southern portion of the site; gauges TT-8 and TT-9 monitor the reference area.

2.2 Hydrologic Description

There are eleven monitoring gauges and one rain gauge installed onsite (Figure 2). The automatic monitoring gauges record daily readings of groundwater depth. This is the fifth year of hydrologic monitoring on the site.

The principal hydrologic source for this site is precipitation with some input from Buckskin Creek. The Tucker Tract Site involved the grading of the field crowns and placing the excess into several drainage ditches to prohibit water from leaving the site. An additional seven to nine inches of fill was brought in to bring the site elevation to its final grade. Several earthen berms were constructed adjacent to the lower areas of the site and adjacent to the residential area. This design will restore wetland hydrology, restrict infiltration losses and surface runoff, and avoid flooding the adjacent residential area. The hydrologic monitoring should show the reaction of the groundwater level to specific rainfall events.

¹ Natural Resources Conservation Service, Soil Survey of Currituck County, North Carolina, p.71.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 239-day growing season. The results are presented in Table 2. Appendix A contains a plot of the groundwater depth for each monitoring gauge and the surface water depth recorded by the surface gauge. The maximum number of consecutive days is noted on each graph. The individual precipitation events, shown on the monitoring gauge graphs as bars, represent data collected from the onsite rain gauge.

Table 2. 2003 Hydrologic Monitoring Results – Groundwater Gauges

Monitoring Gauge	<5%	5-8%	8-12.5%	>12.5%	Actual %	Dates of Success
TT-1+				×	61.1	March 20-August 12
TT-2				×	46.0	March 20-July 7
TT-3+				×	100	March 20-Nov 13
TT-4+				×	100	March 20-Nov 13
TT-5				×	45.6	March 20-July 6
TT-7+				×	100	March 20-Nov 13
TT-8 (REF)+				×	69.5	March 20-Sept 1
TT-9 (REF)+				×	100	March 20-Nov 13
TT-10				×	23.0	March 20-May 13
TT-11				×	43.5	March 20-July 1
TT-12+				×	100	March 20-Nov 13

+ Gauge met the success criterion during an average rainfall month (July, August, and October).

*The two reference gauges are shaded.

Table 3. Hydrologic Monitoring Results (1999-2002)

Monitoring Gauge	1999 % Results	2000 % Results	2001 % Results	2002 % Results
TT-1	16.3	No Data	23.4	26.8
TT-2	17.2	38	10	29.3
TT-3	9.2	25	73.5	53.1
TT-4	21.8	100	61.7	32.2
TT-5	8.8	33	39.1	32.2
TT-6	3	8	4.6	Pulled
TT-7	36.8	100	71.9	35.6
TT-8 (REF)	36	94	61	31.4
TT-9 (REF)	28.9	100	74.4	13.8
TT-10	18.4	33	26.7	26
TT-11			35	28
TT-12			43.8	33
Climate Conditions	Average Rainfall	Average Rainfall	Below Average Rainfall	Average to Below Average Rainfall

*The two reference gauges are shaded.

Table 3 is a summary of the hydrologic gauge data representing previous years (1999-2002).

Figure 3 provides a graphical representation of the hydrologic results. Gauges highlighted in blue indicate wetland hydrology for more than 12.5% of the growing season. Gauges highlighted in red show hydrology between 8% and 12.5% of the growing season, while those in green indicate hydrology between 5% and 8%. Gauges highlighted in gray indicate no wetland hydrology (less than 5% of the growing season).

2.3.2 Climatic Data

Figure 4 is a comparison of monthly rainfall for the period of November 2002 through November 2003 to historical precipitation (collected between 1972 and 2003) for Elizabeth City, North Carolina. This comparison gives an indication of how 2003 relates to historical data in terms of climate conditions. The NC State Climate Office provided all local rainfall information.

For the 2003-year, January (02') and November experienced below average rainfall. The months of December (02'), July, August, and October recorded average rainfall for the site. November 02, February, March, April, May, June, and September experienced above average rainfall. Overall, 2003 experienced an average to above average rainfall year.

Figure 3. 2003 Hydrologic Monitoring Results

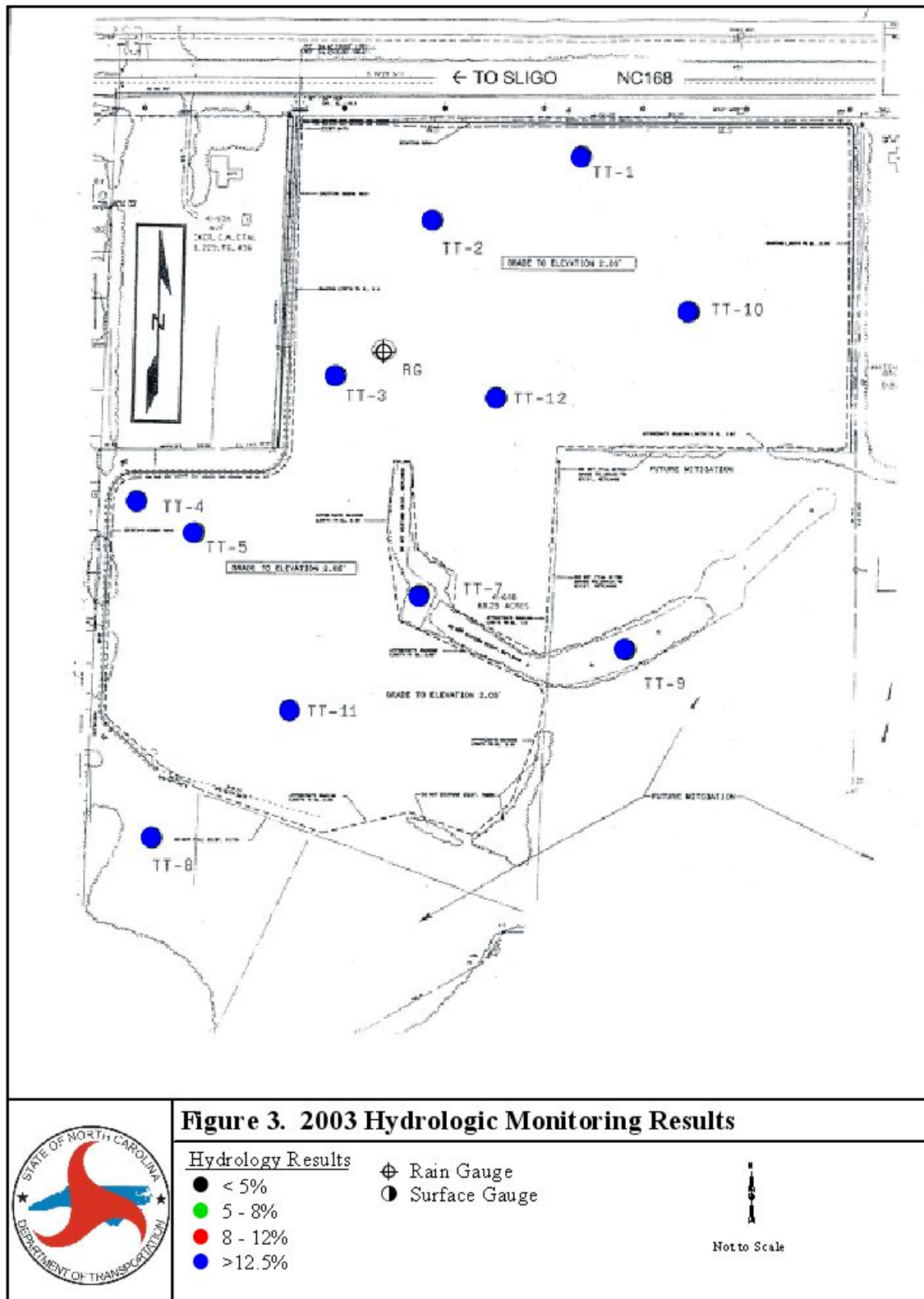
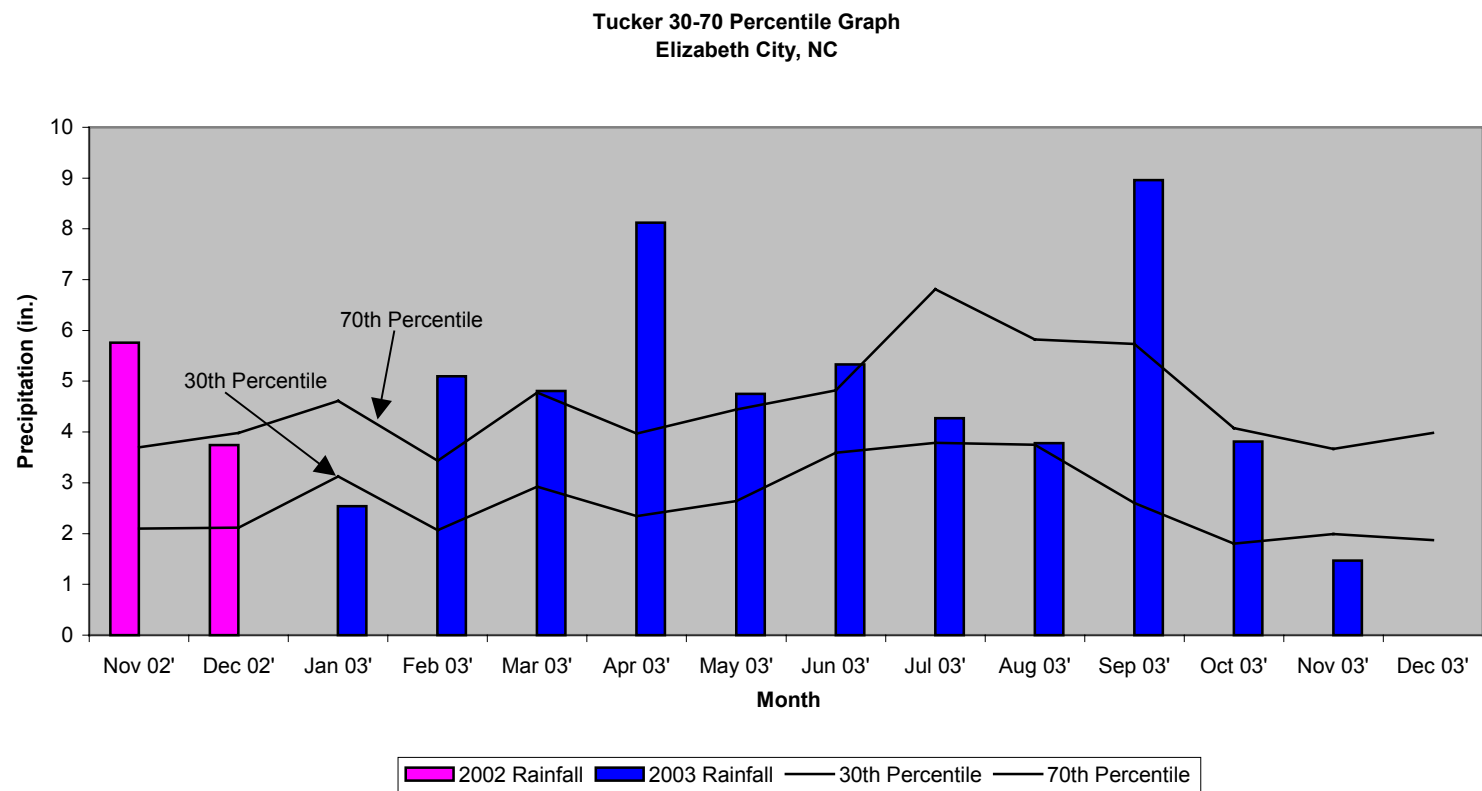


FIGURE 4. 30-70 Percentile Graph



2.4 Conclusions

The 2003-year represents the fifth growing season that hydrologic data has been analyzed. All of the groundwater monitoring gauges met the success criteria with saturation in the upper twelve inches for at least 12.5% of the growing season. Also, the data from the groundwater gauges exhibit similar saturation periods as the reference gauges.

This is the fifth consecutive year that the site hydrology has met the success criteria; therefore, NCDOT proposes to discontinue hydrologic monitoring.

3.0 VEGETATION: TUCKER TRACT MITIGATION SITE (YEAR 5 MONITORING)

3.1 Success Criteria

NCDOT will monitor the site for five years or until success criteria are met. A 320 stems per acre survival criterion for planted seedlings will be used to determine success for the first three years. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4, and 260 stems per acre for year 5). The number of plants of one species will not exceed 20% of the total number of plants of all species planted.

3.2 Description of Species

The following tree species were planted in the Wetland Restoration Area:

Zone 1: Wetland Reforestation (14.05 Acres)

Fraxinus pennsylvanica, Green Ash

Quercus falcata var. *pagodaefolia*, Cherrybark Oak

Quercus michauxii, Swamp Chestnut Oak

Quercus phellos, Willow Oak

Quercus nigra, Water Oak

Quercus lyrata, Overcup Oak

Nyssa aquatica, Water Tupelo

Zone 2: Wetland Reforestation (9.04 Acres)

Taxodium distichum, Baldcypress

Fraxinus pennsylvanica, Green Ash

Quercus falcata var. *pagodaefolia*, Cherrybark Oak

Quercus michauxii, Swamp Chestnut Oak

Quercus phellos, Willow Oak

Quercus lyrata, Overcup Oak

Zone 3: Wetland Reforestation (1.89 Acres)

Quercus phellos, Willow Oak

Quercus nigra, Water Oak

Fraxinus pennsylvanica, Green Ash

Taxodium distichum, Baldcypress

Quercus lyrata, Overcup Oak

Nyssa aquatica, Water Tupelo

Quercus michauxii, Swamp Chestnut Oak

3.3 Results of Vegetation Monitoring

Table 4. Vegetation Monitoring Results

ZONE	Plot #	Overcup Oak	Water Tupelo	Green Ash	Baldcypress	Water Oak	Willow Oak	Swp. Chestnut Oak	Cherrybark Oak	Total (5 year)	Total (at planting)	Density (Trees/Acre)
1	4			12		2	8	5	5	32	55	396
	5	1		10			10	10	2	33	48	468
	8			16	10	1	5	5		37	52	484
	9			10	4		12	2	4	32	40	544
	10			8	6	1	3	1		19	39	331
	11			5	6			6		17	48	241
ZONE 1 AVERAGE DENSITY												411
2	6	4			14		9	2	1	30	50	408
	7	7		3	14		2			26	62	285
	12	5		8	10		2		1	26	48	368
ZONE 2 AVERAGE DENSITY												354
3	1	10	3	12	10		1			36	53	462
	2	19					2	3		24	51	320
	3	10	8	9	9		2			38	56	461
ZONE 3 AVERAGE DENSITY												414
TOTAL AVERAGE DENSITY												397

Site Notes: Site is well vegetated with various grasses, a variety of *Juncus* sp., and sedges. 6 to 8 inches of standing water noted in a small area of plot 7. Other species noted: volunteer pines, *Scirpus* sp., *Aster* sp., cattails, *Baccharis halimifolia*, foxtail, woolgrass, fennel, pickerel-weed, *Cyperus* sp., pennywort, *Panicum* sp., *Lespedeza* sp., red maple, sawgrass, and *Sesbania* sp.

At the request of the resource agencies, NCDOT performed supplemental planting of baldcypress trees in and around plots 8, 9, 10, and 11 (Zone 1) in March 2003.

3.4 Conclusions

Of the forty-eight acres on this site, approximately twenty-five acres involved tree planting. There were twelve monitoring plots established throughout the planting areas. The 2003 vegetation monitoring of the planted areas revealed an average density of 397 trees per acre, which is above the minimum requirement of 260 trees per acre.

NCDOT proposes to discontinue vegetation monitoring at the Tucker Mitigation Site.

4.0 OVERALL CONCLUSIONS AND RECOMMENDATIONS

The results of the fifth year of monitoring indicate that the Tucker Tract Mitigation Site is successful and has met hydrologic and vegetation criteria for the fifth consecutive year.

All of the groundwater monitoring gauges met the success criteria with saturation in the upper twelve inches for at least 12.5% of the growing season. Also, the data from the groundwater gauges exhibit similar saturation periods as the reference gauges.

Vegetation monitoring also met the success criteria in the fifth year. The average density for the twelve monitoring plots (397 trees/acre) was above the required 260 stems/acre.

Based on the hydrologic and vegetation monitoring, the Tucker Tract Mitigation Site met the success criteria for the site during the 2003-growing season. The site has demonstrated both hydrologic and vegetation success for five consecutive years. NCDOT proposes to discontinue hydrologic and vegetation monitoring on the Tucker Tract Mitigation Site.

APPENDIX A

GAUGE DATA GRAPHS

APPENDIX B

SITE PHOTOS PHOTO AND PLOT LOCATIONS

Tucker Tract



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

2003

Tucker Wetland Photo and Plot Locations

